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## **CLAIMS**

What is claimed is:

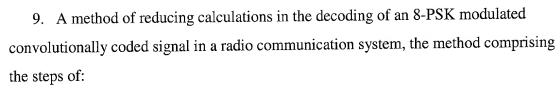
- A method of reducing calculations in the decoding of a M-ary modulated
  convolutionally coded signal in a radio communication system, the method comprising the steps of:
  - a) determining a single function for a soft-decision metric for each bit in a symbol by restricting the set of all possible Gray-coded constellation points to those closest to a boundary between a bit value of 0 and 1 for each bit in the input symbol and applying a predetermined function corresponding to the range of restricted constellation points to the entire possible range of symbols;
  - b) inputting a symbol having real part, x, and an imaginary part, y;
  - c) setting a soft-decision metric for each bit in the symbol using the predetermined function from the determining step;
  - d) outputting the soft-decision metrics for each bit of the symbol to a turbo decoder;
  - e) decoding the symbol in the turbo decoder; and
  - f) repeating steps a) through e) until all symbols to be input are decoded.

- 2. The method of claim 1, wherein the setting step includes a substep of scaling the soft-decision metrics.
- 3. The method of claim 2, wherein the scaling substep includes scaling the soft-decision metrics by a factor of  $\beta A_d / A_p$ , wherein  $\beta$  is the squared magnitude of the filtered pilot signal, and  $A_d$  and  $A_p$  are the data and pilot signal gains, respectively.
  - 4. The method of claim 1, wherein the predetermined function of the determining step is defined by the difference between the squares of the distances between the restricted constellation points having 0 and 1 bit values and a hypothetical symbol falling within the range of restricted constellation points.

- 5. A method of reducing calculations in the decoding of an 8-PSK modulated convolutionally coded signal in a radio communication system, the method comprising the steps of:
  - a) providing a set of eight possible Gray-coded symbols for the 8-PSK modulated signal in a constellation;
  - b) defining radial boundaries in the constellation bisecting the points in the constellation;
  - c) inputting a symbol having real part, x, and an imaginary part, y;
  - d) plotting the location of the symbol in the constellation;
- e) locating the two nearest constellation points to the symbol having a 0 value and a 1 value for each bit;
  - f) setting a soft-decision metric for each bit using the two nearest constellation points from the locating step;
  - g) outputting the soft-decision metrics for each bit of the symbol to a turbo decoder;
- 15 h) decoding the symbol in the turbo decoder; and
  - i) repeating steps a) through h) until all symbols to be input are decoded.

- 6. The method of claim 5, wherein the inputting step includes phase shifting the symbol by  $e^{j\pi/8}$ .
- 7. The method of claim 5, wherein after the setting steps, further comprising the step of scaling the soft-decision metrics.
- 5 8. The method of claim 7, wherein the scaling step includes scaling the soft-decision metrics by a factor of  $\beta A_d / A_p$ , wherein  $\beta$  is the squared magnitude of the filtered pilot signal, and  $A_d$  and  $A_p$  are the data and pilot signal gains, respectively.

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- a) inputting a symbol having real part, x, and an imaginary part, y;
- b) setting a soft-decision metric of the first bit of the symbol equal to the value of the imaginary part, y, of the symbol;
- c) setting a soft-decision metric of the second bit of the symbol equal to the value of the real part, x, of the symbol;
- d) setting a soft-decision metric of the third bit of the symbol equal to

$$(|x|-|y|)\frac{1}{\sqrt{2}}$$

- e) outputting the soft-decision metrics for each bit of the symbol to a turbo decoder;
- f) decoding the symbol in the turbo decoder; and
- g) repeating steps a) through f) until all symbols to be input are decoded.
- 10. The method of claim 1, wherein the inputting step includes phase shifting the symbol by  $e^{j\pi/8}$ .